Peter McCarthy

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Principal Engineer

Career Highlights

April 2025-Present

Side Project
I am currently working on an AI / AR side project.

- **Technologies**: TypeScript, Python, Kotlin, Next.js (React.js, Tailwind, Node.js), Vercel, Voyage AI (embeddings), Chroma and Pinecone (vector databases), Model Context Protocol (MCP), Anthropic Claude (LLM), Meta Quest 3S

Y Combinator S25
During May, I submitted a Summer 2025 Batch application to fund an EdTech start-up.

April 2021-April 2025: Promethean Limited

Principal Engineer (2023-2025). I continued the work undertaken as Senior Software Engineer, with added responsibilities and accountability.

Senior Software Engineer (2021-2023). In this role, I researched emerging and existing software (and occasionally hardware) technologies for use in future products, and developed proof-of-concepts / prototypes for demonstration (to senior leadership) and hand-over (to development teams).

- **Technologies**: C / C++, C#, Java (Android), Swift, Python, JavaScript, React.js, Node.js, WASM, open-source AI models (Llama, Stable Diffusion, SAM, Whisper), Hugging Face Transformers and Diffusers, AWS (API Gateway, EC2, S3), OpenCV, LIVE555, FFmpeg (libavcodec), libyuv, SDL2, libusb, Windows, Linux, Chrome OS, Android, iOS / iPadOS / watchOS / tvOS, HTTP (REST, SSE), WS (Web Sockets), USB (Bulk Transfer), Bluetooth (GATT, L2CAP), UWB

2018-2021: Nationwide Produce PLC

(Full-stack) Software Developer. In this role, I designed and developed a number of Android / iOS mobile-driven solutions to support the operation of the business in key areas such as product sales, quality control, warehouse picking and stock control.

2008-2018: Bibbol Ltd

Founder | Software Developer. In this role, I designed, developed, and marketed, Podium and Watchman, demonstrated these solutions to retailers, and built commercial partnerships.

- Podium: A mobile solution for controlling a retailer's CCTV system
- Watchman. A wearable solution for receiving instant (text and photo) notifications triggered by alarms and suspicious activity

Education Highlights

1988-1991: University of Liverpool

- BSc (Hons) **2:1** Computer Science

Experience & Skills

I have many years experience in designing and developing software and systems. I have built a diverse range of full-stack solutions for Cloud (AWS), Desktop (Windows, Linux), Mobile (Android, iOS, iPadOS), Wearable (Android Wear, watchOS) and IoT, using a wide variety of runtimes, languages, frameworks, models (AI), databases and tools. I also have experience in leading developers and managing projects, and have started and run my own small business.

Currently, I am researching and developing in technology areas such as **Agentic AI** and **Augmented Reality**.

I am someone who can think differently and solve problems in innovative ways. I am very creative, love to build things, have a flair for design, and possess great attention to detail. Also, I am self-motivated and self-taught, hard-working, trustworthy, and am constantly striving to improve myself.

Languages

Application

- JavaScript (browser, Node.js)
- TypeScript
- Python
- C#
- C / C++
- Java / Kotlin (Android)
- Swift

Presentation

- HTML5
- CSS3

Query

- T-SQL
- XPath

Frameworks, Libraries & APIs

Frameworks / Libraries

- React
- React Native
- Tailwind
- Express
- Next.js
- .NET / ASP.NET
- Android SDK
- Core Bluetooth, Nearby Interaction (iOS / iPadOS / watchOS / tvOS)
- COM / ActiveX

Libraries (C / C++)

- FFmpeg (video)
- libyuv (graphics)
- LVGL (embedded graphics)
- SDL (multimedia)
- LIVE555 (RTSP)
- ZeroMQ (messaging)
- WebSocket++ (Web Sockets)
- libusb (USB connectivity)

APIs (C / C++)

- Android NDK
- POSIX (Linux)
- Win16 / Win32, WinRT (Windows)

AI

Open Source Models

- Llama (language)
- Mistral (language)
- Vicuna (language)
- Stable Diffusion (image generation)
- SAM (image / video segmentation)
- LLaVA (vision)
- Whisper (speech)

Closed Source Models

Platforms & Runtimes

Platforms

PC

- Linux (Ubuntu 18.04 - 22.04)
- Windows 3.1 - 11
- ChromeOS
- macOS Sonoma

Mobile

- Android Jelly Bean - 14

- **Claude**
- **GPT**
- **Gemini**

Libraries / APIs

- **Pytorch**
- **Transformers** (Hugging Face)
- **Anthropic**

RAG

- **Voyage AI** (embeddings)
- **Pinecone** (vector database)
- **Chroma** (vector database)

Agentic

- **Model Context Protocol**

Data

Databases

- SQL Server
- **PostgreSQL**
- MySQL
- SQLite
- DynamoDB

Formats

- **JSON** (including JSON Schema)
- XML (including DTD)
- CSV

User Interface

PC

- GDI / WinForms / WPF (Windows)
- UWP (Windows)

Mobile

- Material (Android)
- SwiftUI (iOS / iPadOS / watchOS)
- React Native (Android, iOS)

Web

- HTML5
- CSS3
- JavaScript
- **PWA**
- Chrome Extension

- iOS 17.5 / iPadOS 17.5

Wearable

- Android Wear 2.0
- Apple Watch 9 (watchOS 10.5)
- **Meta Quest 3S**

SBC

- Raspberry Pi (1 - 4; Zero 2 W)

IoT

- Monnit (sensors)
- Disruptive Technologies (sensors)
- ESP32 (microcontroller)

Cloud

- **AWS: EC2, Lambda, S3**
- **Vercel**
- Hugging Face Hub

Containerization

- **Docker**

Runtimes

- **Node.js 0.10.x - 20.x**
- **.NET (Framework 1.0 - 4.8, Core 1.0 - 3.0, 8.0)**
- Java (Android, J2ME, SE)
- Swift
- Web Assembly (WASM)

Communications

Protocols

Tools

Development

- Serial (RS-232 / 422 / 485)
- UDP, TCP/IP (Sockets)
- HTTP
- WS (Web Sockets)
- RTSP

Messaging

- ZeroMQ
- MQTT

Wireless

- Wi-Fi
- Bluetooth (GATT, L2CAP)
- UWB (Apple U2)
- RFID (Texas Instruments TIRIS)
- IR

Wired

- RS-232 / RS-422 / RS-485
- Digital I/O
- USB

IDE

- Android Studio
- **Visual Studio (Professional, Code)**
- Xcode
- Swift Playgrounds
- Chrome / Firefox (JavaScript debugging)
- Code::Blocks
- Qt Creator

AI

- **Copilot**
- **AI Studio**

Compilers

- gcc
- Emscripten

Productivity / Creativity

- Google Workspace (Docs, Sheets, Slides)
- Office 365 (Word, Excel, PowerPoint)
- Inkscape
- GIMP

Programming Models

- Asynchronous (promises, async / await)
- Multithreaded (mutexes, semaphores)

API Design & Implementation

Shared Library

- SO (Linux)
- DLL (Windows)

Network

- **HTTP (REST, SSE)**
- TCP/IP (Sockets)

Career

April 2025-Present

Side Project

I am currently working on a side project (which may be launched Autumn 2025) that uses **AI** and **AR** technologies. With regards to AI, the project uses Voyage AI (embeddings), Chroma and Pinecone (vector databases), Anthropic Claude (LLM), Model Context Protocol (MCP), and VS Code + Copilot (tooling). The project also uses TypeScript, Python, Kotlin and Next.js (React.js, Tailwind, Node.js), and is hosted on Vercel.

Y Combinator S25

During May, I submitted a funding application for the **Summer 2025 Batch**. The application detailed an EdTech start-up that would build a product capable of generating K-12 classroom Learning Experiences using **AI** and **AR** technologies.

April 2021-April 2025: Promethean Limited

After leaving Nationwide Produce to pursue new challenges, I joined Promethean Limited https://www.prometheanworld.com/gb/.

Role

- **Principal Engineer** (2023-2025). In this role, I continued to research emerging and existing software (and occasionally hardware) technologies for future products, and develop proof-of-concepts / prototypes for demonstration (to senior leadership) and hand-over (to development teams).

  A large percentage of the work I undertook was in the field of **AI**, particularly Large Language Models (text generation) and Diffusion Models (image generation). I also worked heavily with Apple mobile and wearable technologies; investigating how - for example - Ultra-wideband (UWB) could be utilised for spatial computing applications.

  As a Principal, my work had influence on the direction of product development

- **Senior Software Engineer** (2021-2023). In this role, I researched emerging and existing software (and occasionally hardware) technologies for future products, and developed proof-of-concepts / prototypes for demonstration and hand-over

Technologies

- **Platforms**: Windows, Linux, Chrome OS, Android, iOS / iPadOS / watchOS / tvOS
- **Tools**: Visual Studio (Professional, Code), Android Studio, Xcode, Swift Playgrounds; Qt Creator
- **Languages**: C / C++, C#, Java (Android), Swift, Python, JavaScript ES2021
- **Open Source**
  - **AI APIs**: Hugging Face Transformers and Diffusers, OpenCV
  - **AI Models**: Vicuna 13B, LLaMA, Llama 3, Mistral 7B, SD 1.4-2.1, SDXL (Turbo), ControlNet, SAM, LLaVA 1.5, Whisper
  - **Libraries**: FFmpeg (libavcodec), libyuv, SDL2, libusb
- **Frameworks**: React.js (JavaScript), Core Bluetooth and Nearby Interaction (Swift); Qt 5
- **Frontend**: Web (HTML5, CSS3, JavaScript ES2021, WASM); Android (Material); SwiftUI
- **Backend**: Node.js, Python
- **Communications**: HTTP (REST, SSE), WS (Web Sockets), USB (Bulk Transfer), Bluetooth (GATT, L2CAP); UWB
- **Cloud**: AWS, Hugging Face Hub, Telegram

2018-2021: Nationwide Produce PLC

After closing-down Bibbol Ltd, I joined Nationwide Produce PLC https://www.nationwideproduce.com.

Role

- (Full-stack) Software Developer

Project Highlights

- I designed and developed a number of **mobile-driven solutions** to support the operation of the business in key areas such as product sales, quality control, warehouse picking and stock control
  - At the **frontend**, the systems are written in Java (Android), React Native (Android, iOS), React.js, vanilla HTML / CSS / JavaScript, and C# (WinForms)

    - At the **backend**, the service-oriented systems are written in C#, using ASP.NET Core - utilising Web API 2 (for REST) and SignalR (for real-time). SQL Server and T-SQL (sprocs, views, functions) are used to store and query data

- As well as designing and developing, I provided out-of-hours support for the systems if required. I also authored technical specifications and user guides

2008-2018: Bibbol Ltd

After self-employment, I decided to return to the field of retail Loss Prevention & Security, and I founded Bibbol Ltd.

Roles

- Founder
- Software Developer

Project Highlights

- Watchman. A wearable solution for receiving instant (text and photo) notifications triggered by alarms and suspicious activity

    - Comprised server software written in JavaScript (with a HTML / CSS configuration Web UI), running on Node.js, installed on a Raspberry Pi 3 Model B device. SQLite was used to store notification data

    - Comprised client software written in Java, running on multiple Android Wear 2.0 smartwatch devices

    - Client-server communication was performed via ZeroMQ and HTTP (REST), and data was exchanged using JSON

    - I conceived, designed and developed the solution. I also demonstrated the solution to Sainsbury’s, and later forged a partnership with a global tagging business to supply the solution with their own Electronic Article Surveillance (EAS) solutions. Subsequently, the partner demonstrated the solution to a number of UK, European and US retailers

- Podium. A mobile solution for controlling a retailer’s CCTV system

    - Comprised server software written in C (with a HTML / CSS configuration Web UI), installed on a Raspberry Pi 2 / 3 Model B device

    - Comprised client software written in Java and C / C++, running on an Android Jelly Bean / Kit Kat tablet device. To receive, store and render live video, heavy use was made of the FFmpeg and LIVE555 libraries (via Android NDK)

    - Client-server communication was performed via ZeroMQ and HTTP (REST), and data was exchanged using XML and JSON

    - I conceived, designed and developed the solution. I also demonstrated the solution to Asda, Sainsbury’s and Matalan, with interest shown from Next, TK Maxx and One Stop. Furthermore, I forged a partnership with a global tagging business to supply the solution with their own Electronic Article Surveillance (EAS) solutions

- **Bespoke**. I was also been involved with designing and developing a small number of bespoke solutions for other businesses, including:

    - **IoT in Retail**. A proof-of-concept for integrating Disruptive Technologies’ sensor cloud solution https://www.disruptive-technologies.com with the cloud solution of a global tagging business. It comprised server software written in JavaScript, running on Node.js, installed on a Linux VM in Microsoft Azure cloud. It also comprised client software written using Ionic and Angular, running on multiple mobile (Android and iOS) devices. A combination of HTTP (REST) and Socket.io was used for client-server communications. (Cloud) servers communicated using HTTP (REST, SSE)

2002-2008: ingeniosys

I left Gratte Brothers Security Management Ltd to pursue new career challenges, and worked as a self-employed individual while helping to raise a young family.

Roles

- Owner
- Software Developer

Project Highlights

- **On-line Shopping**. I designed and developed, from scratch, a complete online shopping system for the sale of fresh meat and delicatessen produce. This was written in C# and ASP.NET and made use of Microsoft Web Service Enhancements (WSE) 3.0 for secure SOAP communications

- **Websites**. I designed and developed a small number of websites, during which I improved my skills in HTML, CSS, JavaScript, and PHP (with Server Side Includes)

- **Mobile Gaming**. Some 5 years before the iPhone and the App Store, I developed a small number of games for Nokia and Sony mobile phones. These were written in Java (running on J2ME) and were uploaded to a number of app stores for OTA distribution

2000-2002: Gratte Brothers Security Management Ltd

I joined Gratte Brothers Security Management Ltd after its acquisition of Secure Solutions Ltd's development team and systems technology.

Roles

- Development Manager

Project Highlights

- **Sentinel**. On acquisition, the TIGRIS system was renamed to Sentinel and then customised for use in Tesco stores only. I helped to extend the system's functionality, using .NET and C#, which was rolled-out to over 600 stores. The system is still in operation in many stores today

  As part of Sentinel, I designed and developed an **agent-based** module that analysed large quantities of daily Point of Sale (PoS) data to detect activity indicative of theft. Orchestrated agents (written in C and C#) worked together to process data, detect abnormalities, and generate reports.

- **PnP for CCTV**. Before the advent of IP cameras, I worked with Tesco and JVC to create a Plug and Play (PnP) protocol specification for serial communications (RS-422 / RS-485) for CCTV cameras. The specification included protocols for camera discovery and control (pan / tilt / zoom / focus), and was successfully implemented by JVC (with other manufacturers, such as Pelco, considering its implementation)

1991-2000: Secure Solutions Ltd

I joined Secure Solutions Ltd shortly after graduating from the University of Liverpool.

Roles

- Software Developer
- Systems Architect
- Development Manager

Project Highlights

- **RACE** (Reactive Audit Capture and Evaluation). A retail Loss Prevention & Security system that provided CCTV camera control, Point of Sale (PoS) checkout monitoring, and cash-room monitoring
    - Ran on MS-DOS 5.0
    - Written in C
    - Serial (RS-232 / RS-485) networking
    - Piloted in 3 Tesco stores
    - I helped to develop the system, from scratch, with one other software developer and a hardware engineer. I was also involved with supporting the system (telephone and remote desktop)
- **TIGRIS** (Totally Integrated Graphical Retail Information System). A retail Loss Prevention & Security system
    - Ran on Windows 3.1 - XP
    - Written in C, C++, VB6 and HTML / CSS / JavaScript
    - Serial (RS-232 / RS-485), UDP / TCP/IP and RFID networking
    - Comprised the following configurable modules:
        - **Control**; provided control of CCTV cameras
        - **PoS**; monitored Point of Sale checkouts for possible incidents of employee theft
        - **TrolleyTrak**; tracked the movement of trolleys (via Texas Instruments' TIRIS RFID technology) to detect possible incidents of customer walk-out theft (i.e. leaving a store without paying)
        - **Queue Management**; combined PoS and TrolleyTrak to predict customer queues and alert checkout supervisors (via pagers) in advance
        - **ANPR**; monitored vehicle license plates at petrol filling stations
        - **Incident Database**; provided a customer theft reporting tool
    - TIGRIS TrolleyTrak was piloted in 11 Morrisons stores
    - TIGRIS Queue Management was piloted in 1 Tesco store
    - TIGRIS Control and PoS was piloted in a small number of Asda and Safeway stores
    - TIGRIS Control, PoS, ANPR and Incident Database, was rolled-out into over 300 Tesco stores
    - I helped to architect and develop the system, from scratch, with other software developers and hardware engineers. I was also involved in supporting the system (pager / telephone and remote desktop). I later became responsible for the development team and assumed the role of Development Manager

- **Hardware**. I was involved in the design, manufacture and system integration of a small number of in-house developed RACE / TIGRIS hardware devices (such as CCTV camera control joysticks and PoS interface units)

Education

1988-1991: University of Liverpool

- BSc (Hons) **2:1** Computer Science

1986-1988: St John Rigby RC 6th Form College, Orrell

- ‘A’ Level Grade **B** Computer Science
- ‘A’ Level Grade **C** Art (practical and history)
- ‘A’ Level Grade **D** Mathematics

1981-1986: St Thomas More RC High School, Wigan

- 7 ‘O’ Levels (Grade **B** Mathematics, Grade **C** English, Grade **C** Computer Science)

Personal

- **Interests**: Technology (AI, AR), current affairs, music (rock), podcasts, movies, reading (fiction / non-fiction) and sport (cricket, F1, MMA, boxing)

- **Achievements**: I taught myself to code at the age of 13 (C64 BASIC, 6502 assembly). Also, I helped to build a house between the ages of 13 and 16

- **Other**: I have a full, clean driving licence. I am in excellent health (I take no medication). Also, I am a non-smoker